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British Museum (Natural History).

Instructions for Collectors:

No. 4.—INSECTS.

FOURTH EDITION.

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Instructions for Collecting Insects.

In the following instructions the orders of insects are generally referred to by their scientific names; *viz.*—

Hymenoptera. Saw-flies, Gall-flies, Ichneumons, Ants, Wasps, Bees.

Diptera. Gnats, Daddy-long-legs, Horse-flies, House-flies, and other two-winged flies.

Lepidoptera. Butterflies and Moths.

Trichoptera. Caddis-flies.

Neuroptera. Termites (White Ants), Stone-flies, Ant-lions, Lace-wings, May-flies, Dragon-flies.

Orthoptera. Earwigs, Cockroaches, Mantids, Phasmas (Stick-insects), Crickets, Locusts, Grasshoppers.

Coleoptera. Beetles.

Hemiptera. Bugs.

Homoptera. Cicadas, Lantern-flies, Froth-flies, Aphides, Scale-insects.

Collecting Material and Apparatus.

Nets, pill-boxes, glass tubes, cyanide killing-bottle, collecting-tin, collecting-bottle, strong knife or digger, lantern.

Pins, corked boxes, forceps (curved and fine), brushes, gum, card, round punch, pocket-lens, fine-pointed scissors.

Naphthaline in flakes, carbolic acid, chloroform, spirit.

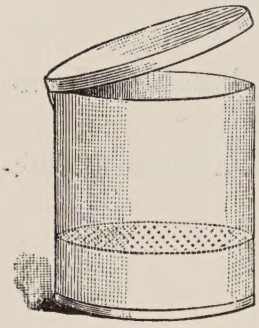
Nets of at least two kinds are necessary for general collecting: an umbrella-net for beating, sweeping, etc.; and a cane-net for catching insects on the wing. It is, however, desirable to have a large kite-net for catching butterflies, and a strong iron ring-net for water insects.

Pill-boxes of all sorts are useful, and common chip-boxes are very handy; but it is especially desirable to have as many glass-bottom

boxes as practicable. To prevent these getting damp, they should have at least the top and edges painted with shellac or enamel paint.

Cyanide Killing-bottle.—This should be a wide-mouthed bottle. At the bottom put about 1 ounce of fused cyanide of potassium, broken into small fragments, then enough dry plaster of Paris nearly to cover it (filling in the interspaces), and on to the top of this pour some plaster mixed with water to the consistency of thick cream, to make about $\frac{1}{4}$-inch thickness over the cyanide. As some heat is generated during this process, it is well to stand the bottle in warm water to prevent it cracking. Besides this portable bottle it is well to have a larger jar, similarly made, for killing specimens when taken home.

CYANIDE KILLING-BOTTLE.



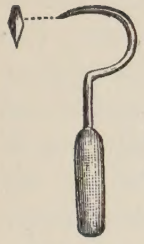
COLLECTING-TIN.

Collecting-tin.—This is very useful for some purposes. It has a false bottom of perforated zinc. In the space at the bottom is placed some blotting-paper, with a few drops of chloroform or pure benzole. The insects are put into the upper part; and to prevent them rolling about, it is well to put some crumpled pieces of blotting-paper or muslin in first.

Zinc Collecting-box.—Boxes made of zinc and lined with cork are to be had from Natural History agents. The cork should be well moistened with water, and then four or five drops of strong carbolic acid added. Specimens can be kept in a relaxed state for a considerable time in a properly prepared box.

COLLECTING-BOTTLE.

Collecting-bottle.—This is a bottle specially made for entomologists. It is compressed, so that it may be carried conveniently in the pocket. It has a glass tube or large quill passed through the cork, fitted with a plug. It is very useful for collecting small Coleoptera, etc. A piece of crumpled muslin should be placed in it for the insects to cling to. The cork should be covered with sealing-wax on the inside to prevent insects burrowing into it.



DIGGER.

Trowel and Digger.—One or both of these are necessary for digging in the ground, for ripping off bark of trees, etc. A narrow fern-trowel answers best.

FORCEPS.

Forceps.—Entomological forceps are made with curved points for taking hold of pins: straight, fine pointed forceps for setting are very necessary; they should have very little spring, and are best made of brass.

Gum.—For gumming small insects on card some entomologists use gum-tragacanth, as it is not conspicuous; but it has the great disadvantage of being very difficult to wash off. Gum-arabic, with a very small quantity of powdered loaf-sugar and one or two drops of glycerine, is perhaps the best mixture. If pure gum-arabic is used, the insects are liable to spring off. The sugar and glycerine prevent this; but the latter must be used very sparingly, as it has a tendency to attract moisture, which is one of the entomologist's greatest foes. For some purposes, Le Page's liquid glue (Russia Cement Co.) is invaluable. Some entomologists use McCaw's seccotine, a very similar preparation, which has the advantage of being sold in metal tubes, so that it is portable.

Card.—A hard white card or two-sheet Bristol board should be used.

Round Punch.—This should have a diameter of about $\frac{3}{4}$ inch for cutting out circles of card the use of which is explained further on. A 20-bore gunwad-punch answers well.

Larva-preserving Apparatus.—This consists of spirit-lamp, small oven, and inflator. Instead of an oven a piece of copper gauze placed over the flame of the spirit-lamp answers very well. The whole apparatus can be obtained from entomological agents.

Collecting.

Besides those which may be caught on the wing with a butterfly-net, insects should be looked for on flowers, under bark of trees, in rotten wood, in decaying animal and vegetable matter, under stones, under fallen leaves (where there is moisture), at the roots of grass

and trees, in ants' nests, in ponds and streams. When circumstances permit, and small insects are being sought for in dead leaves, etc., the leaves should be sifted over a sheet of paper. If the insects appear numerous, the siftings should be put into a holland bag, and examined at home. Many small insects which would be overlooked out of doors may be found in this way. Many insects are obtained by sweeping herbage with a net; others by beating trees while a large net or umbrella is held beneath.

Ground-beetles may often be caught by putting a piece of meat or bone in a pickle-bottle, and burying it so that the mouth is just on a level with the ground.

Moths, some beetles, and other nocturnal insects are obtained by painting patches of sugar on the trunks of trees, and looking for them with a lantern after dark. The mixture used should be made with brown sugar, beer, and a little rum. Apples cut into quarters, smeared with sugar and hung up, also attract moths.

Moths may also be caught by hanging up a sheet with a lantern behind it. They are attracted by the light, and, settling on the sheet, may be picked off with glass-bottom boxes or with the killing-bottle.

Some beetles and other insects may be obtained by hanging up skins of animals, or the carcases of small mammals or birds. Strangely enough, some butterflies are attracted in this way, as well as by strong cheese.

Killing.

Most insects can be easily killed by putting them into the cyanide-bottle; but care must be taken to see that the sides of the bottle and surface of the cyanide are not wet, as the more delicate insects are apt to stick to the surface and get spoiled. To prevent this when collecting, the upper space may be partly filled with crumpled pieces of blotting-paper, among which the insects may bury themselves. This also prevents them rolling about and injuring one another. Under no circumstances should the specimens be left in the cyanide a moment longer than necessary. Cyanide changes the colour of some insects, green becoming yellow, yellow becoming red.

Coleoptera, Hemiptera, Orthoptera, and other non-hairy insects may be killed by throwing them into boiling water; but they must be taken out as quickly as possible, and placed on blotting-paper to drain off the water.

Lepidoptera may be killed in the cyanide-bottle, and then pinned into the zinc collecting-box, where they can remain in a relaxed condition until it is convenient to set them.

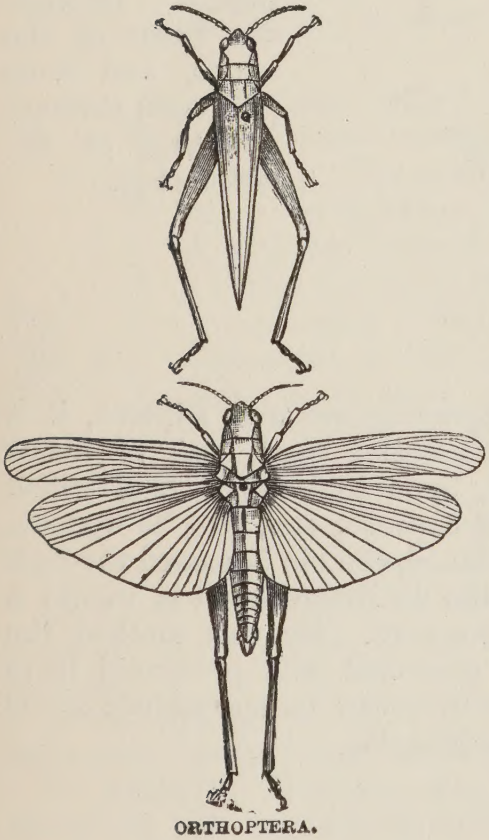
Butterflies may be killed by pinching the thorax laterally while the wings are in an upright position; but although this is necessary sometimes, it requires to be done with care, as it is apt to distort the body and render the specimens difficult to set.

Pinning and Mounting.

The entomological pins in use in the Museum are Nos. 11, 16, 22, all $1\frac{3}{8}$ inches in length (D. F. Tayler & Co., New Hall Works, Birmingham, but can be obtained from Entomological Agents) at 1*s.* per ounce. No. 11 is a thick pin for large specimens; No. 16, a little thinner, is in general use; but No. 22, a trifle thinner, is more suitable for Coleoptera of medium size. The short finer pins are No. 20, a very fine pin for mosquitoes and very small insects. No. 10 (3*s.* 6*d.* per ounce) and 5 (1*s.* 6*d.* per ounce) are degrees stouter. An ounce of No. 20 (7*s.* 6*d.* per ounce) contains about 3,750 pins; but these short pins can be obtained in quarter-ounce boxes. An ounce of No. 16 contains 320 pins.

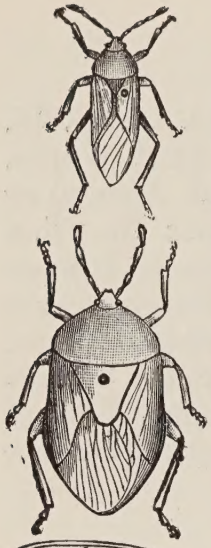
HYMENOPTERA.

Hymenoptera, *Diptera*, *Lepidoptera*, and *Neuroptera* should be pinned through the middle of the thorax. The position of the pin is indicated in the illustrations by a black dot.



ORTHOPTERA.

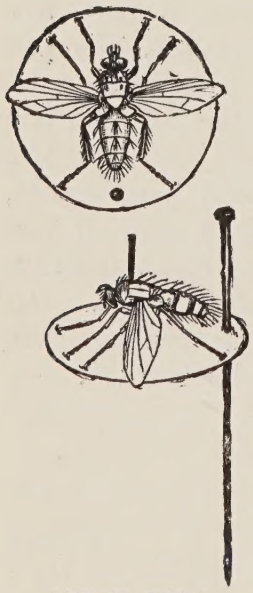
Orthoptera should be pinned in the middle, between the bases of the wings. Of course, if they are pinned without being set, the pin must pass through the wings; in which case it is better through the right wing. In some instances the pronotum is produced backwards, so as to cover a great part of the body; in which case the pin must necessarily pierce this part. In most cases it is desirable to have specimens pinned in both ways.



Hemiptera should as a rule be pinned through the right wing in the same way as Coleoptera; but where the scutellum is large, it is necessary to pierce this part a little to the right of the centre, so as to avoid any central spot or mark. When the wings are set out, the pin may be in the centre.

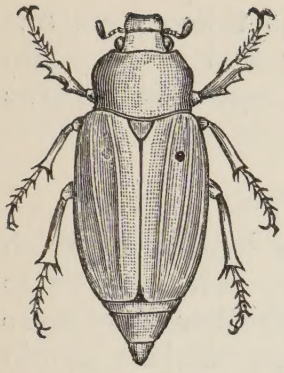
Homoptera.—The Cicadas and other species with large mesothorax should be pinned through this part; others may be pinned between the bases of the wings, and some (if unset) through the base of the right wing.

HOMOPTERA.



When pinning Hymenoptera and Diptera, it is very useful to use circular card discs of about $\frac{3}{4}$ inch in diameter, upon the *under* side of which the locality, date of capture, etc., can be written. After the insect is pinned, the pin is passed through the middle of the disc until the insect is within a short distance of the card. By this method the legs are not only protected and prevented from hanging down, but they can be spread out so as to be ready for examination.

USE OF DISCS.



COLEOPTERA.

Coleoptera should be pinned through the right wing-case near the base, and in such a way that the pin comes out below behind the middle pair of legs. As a rule the pin should be equally distant from the base and the side of the wing-case.

STAGING.

Staging.—This is a very convenient method of dealing with small insects, for which a very fine pin is used. The insect is pinned in the usual way, and the pin is passed through one end of a narrow strip of card, cork, or pith, and a strong full-length pin through the other end of the strip. The strip may be vertical as in the illustration, or horizontal as in carding. In this way the smaller insects can be kept at the same level as the larger ones, and there is plenty of room on the longer pin for labels. A very suitable material for staging is a fungus called *Polyporus*, which is cut into strips and sold for the purpose by dealers.

CARDING.

Carding.—Small Coleoptera, Hemiptera, and some other insects are most easily mounted by being gummed on card. The card should only be sufficiently large to carry the specimen safely, with just room to take hold of the pin without risk of touching the insect. But a better way is to place the insect across a very narrow strip of card. This, although not quite so safe, has the advantage of allowing some of the under side of the insect to be seen. The specimen should always be on the left hand of the pin when the head is turned from the operator.

Habits.

Notes on the habits of insects, number of broods, whether common or otherwise, if taken singly or paired, are always of interest.

Nests, cocoons, and galls are of very small value, unless accompanied by the insect which constructs or causes them.

In collecting Termites, the kind of nest they were taken from should be noted, or photographs of the nest taken. Termites' nests

with the specimens are much wanted. Specimens taken from one nest should be kept together, either in a tube or tied in a muslin bag. The same precaution should be taken with regard to the true ants (*Formicidæ*).

Labelling.

Specimens should be distinctly labelled with the locality in which they were taken, date of capture, elevation, etc. With regard to Lepidoptera, it is also important to mention whether they were obtained during the wet or dry season. These particulars should accompany the specimens themselves, and not be merely noted in a book.

Larvæ.

Persons residing in one place for any length of time can do great service by rearing insects from their larvæ. With many caterpillars this is often quite easy. Larvæ of unknown species, unless possessing some remarkable feature, are of very little interest.

Larvæ of Hymenoptera, Diptera, and Coleoptera may be killed in boiling water, and after remaining in it from one to three minutes (according to the size of the larvæ) may be preserved in spirit.

Caterpillars may be killed in the cyanide-bottle or collecting-tin, and the skins preserved as dry specimens by means of the "larvæ-preserving apparatus" (*see* p. 3).

The contents of the body are removed thus:—The dead larva is laid on a piece of blotting-paper, with the tail farthest from the operator; a pencil (or similar thing) is laid across the tail end, and the contents rolled out of that part: this process is repeated, each time placing the roller a little nearer the head, until the whole body is emptied. Care should be taken, by shifting the position of the larva on the paper, not to let the outside of the skin get wetted. The roller must not be too much pressed. A glass tube drawn out to a point is now inserted in the posterior opening of the skin, and held with the spring, and air is forced into it with the inflator, while the skin is held over the drying-apparatus or in the small oven. When dry the specimen is ready for mounting on a dry stem of grass or other suitable object. Care should be taken not to distend the skin unnaturally.

Preservation.

In damp climates great trouble is experienced in keeping insects in boxes from getting mouldy. This may be prevented to a certain extent by using carbolic acid on a piece of sponge, but unless this is frequently renewed it is not always successful. Recently Dr. Graham in West Africa tried painting his store-boxes inside

and out with medical creosote. This, being a clear fluid, does not stain the paper or wood. When dry, specimens were put into the boxes, and were successfully preserved from mould. The insects were also safe-guarded from attacks by other insects or mites.

Methods of sending Specimens Home.

It is desirable to send home small consignments at a time, and the parcel-post should be used wherever this is practicable. Strong wooden boxes * travel very well in this way; but if pinned specimens are put in a box, *it must be put into another rather larger one*, with cotton-wool or other material firmly (but not too tightly) packed round it. Small boxes or bottles are always preferable to large ones, as an accident to one does not involve serious loss.

Boxes containing pinned specimens must of course be lined at the bottom with cork or thick pith, into which the pins may be stuck firmly. The larger, heavier Coleoptera and Orthoptera should be kept in position by pins placed on each side obliquely. It is desirable to pin a piece of sponge dipped in strong carbolic acid in the box, taking care of course not to let the acid run on to the specimens. Lumps of camphor or naphthaline are *very dangerous* in a box with pinned insects, and should not be used, or if used at all should be enclosed in a muslin bag, and *very firmly* fixed in the corner of the box. Even these bags are very apt to get loose.

For the transit of certain insects, such as Coleoptera, which have not been pinned, spirit may be used; but this should be avoided when possible. The best way is to use *coarse* sawdust from which all fine dust has been sifted. Some naphthaline should be mixed with the sawdust, or, when there is risk of the specimens becoming mouldy, carbolic acid should be used. The boxes or tins containing the specimens in sawdust must be quite filled, otherwise the insects are liable to be injured by shaking about.

When spirit is used, it is desirable to change it at least once after the specimens have been put into it, as the moisture from the insects weakens it. The spirit must bear a fair proportion to the bulk of the insects; in other words, too many specimens must not be put into one bottle. Any space left at the top of the bottle should be filled loosely with soft *paper* to prevent the insects shaking about in transit.

Cotton-wool must *never* be allowed to come in contact with insects, wet or dry. Too much stress cannot be laid on this point.

Bees, *flies*, and other hairy insects should never be put into spirit or sawdust. They should be pinned, if practicable (*see* pp. 5 and 7). When this cannot be done, they may be put into papers in the same way as Lepidoptera; but it is better to put them into match-boxes

* If cigar-boxes are used, care must be taken that they are strong enough, as they are otherwise apt to be crushed in transit.

or pill-boxes with tissue-paper cut into small fragments to prevent them rolling about.

Wasps and other non-hairy Hymenoptera may be put into sawdust.

Diptera. A few of the larger Diptera may be dealt with in the same way as bees; pinned if possible. Species of moderate size should be pinned from above and mounted on card discs (*see* p. 6). The smaller species should be staged (*see* p. 7). When the insect is very soft and the act of pinning indents the thorax, it is better to pass the fine pin through the end of the strip of card first, then lay the fly on its back and pass the pin through the thorax from below. The point of the pin should project about three-sixteenths—*i.e.* well above the thorax.

In some cases it may be found necessary to pass the pin through the side of the insect.*

Lepidoptera should be put into triangular envelopes with their wings folded together over their backs. These envelopes may be made thus: taking an oblong piece of paper (almost any sort will do). Fold it as in fig. 1, then double one edge *up*, and the other down as in fig. 2. This makes them much more convenient for opening than if both edges are folded in the same way. A stock of these of different sizes should be prepared ready for use.

These envelopes may then be packed in tins or strong wooden

Fig. 1.

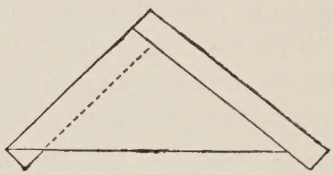


Fig. 2.

boxes, with some naphthaline sprinkled among them. If tins are used, extra care must be taken that the specimens are not damp when the tin is closed. Care must be taken not to crush the specimens by putting too many into one box; on the other hand, they must be sufficiently tightly packed to prevent them shifting about.

Neuroptera should if possible be pinned; but if this is impracticable, they may be put into papers in the same way as Lepidoptera; or they may be laid in chip-boxes, and kept from rolling about with chips of tissue-paper.

Orthoptera wanted for study of the structure may be put into spirit; but those intended for the dry collection are almost useless

* For further particulars see "How to collect Diptera," "How to collect Mosquitoes," and "Blood-sucking Flies, and how to collect them."

if they have been preserved in this manner. They should be dried quickly and put into sawdust. Sometimes they travel well in papers in the same way as Lepidoptera; but they must not be pressed. In the case of large-bodied species, such as Locusts, in a damp climate, it is advisable before doing this to make an incision with a pair of fine scissors along the under side of the abdomen, and, after emptying it of its contents, fill it with cotton-wool.

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